

## INJURY PREVENTION AS A COMBAT MULTIPLIER

BY

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USAWC STRATEGY RESEARCH PROJECT

**INJURY PREVENTION AS A COMBAT MULTIPLIER**

by

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## **ABSTRACT**

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It is no secret that health care costs in the United States are sky rocketing. Over 97% of those costs focus on the “restorative” aspect of health care as opposed to the 3% spent on preventative measures. The Army mirrors society and therefore, the same statistics are applicable to the Army’s health care dilemma. According to Keith Hauret, a leading epidemiologist for the Army’s injury prevention program, overuse injuries across the military account for more than 8 million days of limited duty a year. With recruiting efforts falling short, the Army can ill-afford to have a significant portion of its members incapable of performing their duties due to injuries. Controlling injuries is a high priority across the Department of Defense (DoD) as evidenced by the emphasis on prevention in the 2006 Quadrennial Defense Review, the DoD Directive 6200.4 (Force Health Protection) and the DoD Force Health Protection Capstone Document. The purpose of this paper is to illustrate the importance of a comprehensive injury prevention program that studies potential recruits and their risk for injury, analyzes current injury rates, examines existing training programs and recommends system-wide changes to mitigate the impact of these injuries.



## INJURY PREVENTION AS A COMBAT MULTIPLIER

We need to abandon our fatalistic attitudes. Injuries are not random events; they are the predictable result of a complex set of risk factors, many of which can and should be controlled.

—MG (ret) Patrick Sculley  
Former Deputy Surgeon General  
U.S. Army

As the Army struggles to increase its end strength it can ill-afford to have a significant portion of its members incapable of performing their duties due to injuries. With the operational tempo the highest in decades, leaders at all levels must balance physical training with the competing demands of mandatory unit training. This is extremely difficult as commanders must vie for ranges, Military Operations on Urban Terrain (MOUT) sites, Field Training Exercise (FTX) maneuver space as well as reconstitute equipment in less than a year in order to prepare for the next deployment. Couple this with the Soldier's need to spend time with a family he has not seen in over a year and it is easy to understand why physical training has not changed. It takes relatively little innovation to design a program based upon performing well on the Army Physical Fitness Test (APFT). Most units will do the same exercise routine 3-4 days of the week with the fifth day either devoted to combatives or foot marching. These programs inevitably begin with a number of calisthenics and stretching then transition to muscle failure variations of the sit-up and push-up and finish with some type of running. Moreover, many installations have lengthened the physical training time from 60 to 90 minutes to accommodate combatives training and foot marches. However, this has also meant an increase in muscle failure activities and running mileage and a concomitant increase in overuse injuries. Without adequate rest and treatment, these injuries

become chronic and place Soldiers at unnecessary risk for further injury once deployed. The purpose of this paper is to illustrate the importance of a comprehensive injury prevention program that studies potential recruits and their risk for injury, analyzes current injury rates, examines existing training programs and recommends system-wide changes to mitigate the impact of these injuries.

### Assessing the Force

According to various reports there are somewhere between 70 and 75 million children and young adults born between 1977 and 2000. They are termed Generation Y or “Millennials.”<sup>1</sup> This group is as large or larger than the Baby Boomers and twice as large as Generation X.<sup>2</sup> Generation Y is the fastest growing segment of the workforce comprising 21%<sup>3</sup> and constitutes the vast majority of potential recruits.<sup>4</sup> Therefore, it is incumbent on the Army leadership to know and understand the characteristics and general physical capabilities of these potential recruits in order to develop them physically and mentally for the rigors of combat.

Nearly 80,000 Americans enrolled in the Army last year despite knowing that volunteering their service likely meant a tour in Iraq or Afghanistan.<sup>5</sup> Although they may not agree with the war, they will generally avoid complaining in public.<sup>6</sup> This is a testament to Generation Y’s dedication to civil service, teamwork and their commitment to a cause particularly if they believe it is for the greater good. These soldiers are more globally oriented, technologically savvy and physically more sedentary.<sup>7</sup> The latter has direct implications as to how unit leaders develop and implement physical training programs.

A DoD policy decision mandated that every uniformed service member, regardless of Military Occupational Specialty (MOS) must be combat ready.<sup>8</sup> Experience reveals that for most units, “combat ready” includes weapons qualification, an ability to carry a combat load, wear protective gear, skill in hand to hand combat and MOS proficiency. “Combat ready” does not entail passing the APFT or meeting height/weight standards; however, units continue to design programs centered on these two components.

Taking into account that obesity has tripled over the past 30 years, designing an appropriate training regimen that avoids increasing the risk of injury poses a significant challenge.<sup>9</sup> Additionally, cardio respiratory endurance for males decreased 10% since 1966 while there has been no significant change in women.<sup>10</sup> This too, has an impact on the common foot soldier’s ability to withstand long hours of patrolling while wearing up to 40-60 pounds of equipment. Furthermore, lower cardio respiratory fitness and/or lower muscular endurance irrespective of gender directly correlate with an increase in injury rates or discharges among basic trainees.<sup>11</sup>

According to the Centers for Disease Control, the number of high school students that participated in daily physical education dropped from 42% in 1991 to 33% in 2005, which has a direct bearing on the physical condition of the juniors and seniors who are likely to enter the service.<sup>12</sup> Interestingly, even with the rise in obesity, studies show that body composition does not correlate well with an increase in injury rates.<sup>13</sup> According to the National Health and Nutrition Examination Survey (NHANES) a person is obese if he or she has a Body Mass Index (BMI) of 30.0 or higher and overweight if his or her BMI is 25.0 – 29.9.<sup>14</sup> One must bear in mind that the Army imposes strict body composition standards and potential recruits must adhere to these standards.

Therefore, the likelihood of having a force that is composed of obese recruits is slim. However, there is an impact on the health care system as the overall number of cases of diabetes increases and leads to increased demands on future health care.

Recognizing the challenges a new generation of soldiers poses from a fitness perspective, DoD employed the National Academy of Sciences to independently study and assess the fitness for military enlistment and make recommendations for improving fitness while decreasing musculoskeletal injuries among first term military enlistees. Recognition of an increase in attrition among a decrease in a recruitment pool prompted the Army to institute system wide changes in three distinct areas: assessment of individual fitness prior to the Soldier entering Basic Combat Training (BCT); implementation of Physical Readiness Training during BCT; and expansion of the Physical Training and Rehabilitation Program (PTRP).

All potential recruits take an entry-level physical fitness test and based upon the results they leave for BCT or attend a Fitness Assessment Program (FAP). From October 1999 through May 2004, this assessment occurred at the reception station. In June 2004, the recruiters bore the responsibility of sending a physically capable recruit to BCT. Several studies demonstrated the efficacy of pre-conditioning recruits who as a result of the pre-training, had a decrease in attrition as well as lower injury rates compared to soldiers with similar low fitness who did not pre-condition.<sup>15</sup>

In 1995, Fort Jackson developed the Physical Training and Rehabilitation Program (PTRP), which provided a supervised rehabilitation program for injured Soldiers unable to continue training.<sup>16</sup> Admittance to this program expanded in 1998 to accommodate Soldiers who were unable to train 5-7 consecutive days or had an injury that required

multiple periods of limited duty. These Soldiers remained in this program until they could resume BCT without limitations.<sup>17</sup> Of the Soldiers assigned to PTRP in 1998, 52% returned to complete BCT with 91% of those graduating.<sup>18</sup>

As the number of Soldiers participating in PTRP increased, the Army began assessing the training regimen utilized by BCT units. Careful examination of the physical fitness status of incoming recruits revealed a generation of young adults who did not participate in high school athletics, physical education or intramural sports. Although the national recommendation for school-age children is 60 minutes or more of moderate to vigorous physical activity per day, in 2005 more than 65% of students in grades 9-12 did not meet this goal.<sup>19</sup> Furthermore, over 13.1% of high school aged children were overweight.<sup>20</sup> These trends necessitated a change in physical training at BCT and Advanced Individual Training (AIT) in order to decrease attrition. The United States Army Physical Fitness School proposed a phased approach aimed at developing strength, endurance and mobility. During the Physical Readiness Training (PRT) program, Soldiers progressed through a toughening phase followed by a conditioning phase which allowed joints, muscles and tendons to systematically adapt to the stresses and strains placed upon them during BCT and AIT without causing undue increase in overuse injuries.<sup>21</sup> For BCT, the program called for a significant reduction of formation running and substitution of interval training and movement drills.<sup>22</sup> The results were astounding as the risk for an overuse injury was 52% less for men and 46% less for women in the PRT group compared to those participating in the traditional physical training regimen.<sup>23</sup> In addition to the lower risk of overuse injuries, the PRT participants had a higher first time pass rate on the APFT and a lower rate of APFT failure when

compared to traditional physical training in BCT.<sup>24</sup> This study and others prompted the Army to adopt PRT throughout BCT and AIT. In addition, each installation that has BCT has a PTRP unit that rehabilitates injured recruits. The combination of pre-conditioning, implementation of PRT and the addition of PTRP units enabled the Army to decrease its attrition rates (85% vs. 81% for men and 80% vs. 70% for women when comparing those who participated in these programs versus those who did not). The challenge now is how to maintain or cultivate the culture of change from BCT and AIT to the regular active forces where leaders are entrenched in the old way of physical training and are very resistant to change.

### Impact of Injuries

Multiple studies confirm that musculoskeletal injuries in the Army are the single greatest impediment to military readiness.<sup>25</sup> An unpublished study conducted from January 2000 through December 2000 at Aberdeen Proving Grounds noted that injuries sustained during physical training accounted for 65% of the total injuries and of those 76% were due to running.<sup>26</sup> The spine and lower extremity accounted for the majority of the injuries.<sup>27</sup> Similarly, statistics obtained from a physical therapist deployed to Iraq from September 2005 through early January 2006 further confirmed the impact of musculoskeletal injuries, as 94% of the injuries treated were non-combat and of those over 50% were chronic conditions that existed prior to deployment.<sup>28</sup> Nearly 45% of the injuries were to the spine with the majority to the lower back, 35% to the lower extremities and 21% to the upper extremity.<sup>29</sup>

Although PRT has effectively demonstrated its usefulness at the BCT/AIT level, it has yet to cross the barriers into the active force that adheres to the dated Physical

Fitness Training Manual (FM 21-20). Originally designed to assist the Commander in developing a well-rounded physical training program, the manual is rarely used effectively. The only time many leaders dust off the manual is during the bi-annual Physical Fitness Test, otherwise it is relegated to a shelf somewhere in the training room. The fitness test itself serves as the basis for unit physical training programs with many units simply performing the “daily dozen” consisting of calisthenics and stretching, then proceeding to a variation of sit-ups and push-ups before going on a traditional 2-6 mile run.

The purpose of the APFT is to test muscular endurance and cardiovascular fitness on large numbers of Soldiers in a relatively short time, and not as the basis for physical training. Training for the APFT will not prepare Soldiers for combat and an over emphasis on muscle failure activities and formation running lead to an unacceptable level of overuse injuries. A perfect score is 100 points in each event and there are soldiers who can “max” their APFT score (300 points) but cannot carry a combat load for 4 miles. Monthly Unit Status Reports (USRs) further emphasize adherence to training for the APFT as units report their average aggregate APFT score and the number of APFT failures. There is no incentive for unit commanders to change their current course of physical training. Pushing soldiers to run excessive miles in an effort to improve their two-mile run scores on the APFT, results in an increase in injuries with little improvement in performance. A landmark study in 1994 clearly highlights this point. A battalion of infantry basic trainees who ran 56 miles over a 12-week period had 24% fewer injuries and improved their overall two-mile run time when compared to another infantry battalion who ran 130 miles during the same 12-week period.

Recent data collected from August 2005 through July 2007 by physical therapists assigned to the Brigade Combat Teams, show 29.6% of the Soldiers seen had injuries that pre-existed prior to deployment.<sup>30</sup> Traditionally, Unit Status Reports portray statistics that shed negative light upon the unit submitting the report. Because temporary profiles often result in lost duty days or man-hours, which in turn translate into dollars lost, it is imperative that injury prevention becomes a priority and holds commanders responsible. Reversing the trend of “negative” reporting in the Unit Status Report is an important first step. A section on the USR that addresses Well Being is one method of emphasizing prevention in a “positive” manner. Rather than reporting the number of Soldiers on profile, units should report the number of Soldiers who came off profile, improved their physical fitness scores, weight loss, etc. If units reported an operational readiness rate on their most important asset – Soldiers – and held leaders accountable, it might force a necessary change in physical training programs. “By following the principles of smarter physical training, individuals and units can achieve greater fitness success in a shorter period of time while losing fewer soldiers to attrition, thereby improving readiness and reducing the burden of injury to the healthcare system.”<sup>31</sup>

Physical Therapists (PT) at the unit level have long proven their effectiveness particularly with the Rangers and Special Operations. With the additional requirement of PTs at the regular line Brigade Combat Teams, the opportunity to assist in injury control and prevention is unprecedented but requires top-down emphasis. Senior leaders must encourage their commanders to design physical training programs based upon the units’ Mission Essential Task Lists (METLs) rather than a limited set of skills: sit-ups,

push-ups and distance running. “Focusing on the mission in the design of fitness training is the most effective use of limited time, provides a variety of training, decreases the risk for overuse injuries and ultimately develops better, stronger warriors.”<sup>32</sup> Soldiers are akin to professional athletes and different sports require different sets of skills. Soccer teams train differently than football teams. Such is the case in the Army where the physical demands of an infantry soldier are decidedly different from those of a helicopter mechanic and their physical training must reflect those differences.

As mentioned previously, all Soldiers must possess a common set of skills; however, beyond these common skills, Soldiers must and should train to meet the demands of their profession. Entire training regimens need to be adjusted. Deployment statistics clearly demonstrate the number one complaint is spinal pain, followed by lower extremity, then upper extremity. Many of these injuries result from improper training prior to deployment that translates into an inability to withstand the physical demands during deployment. “By incorporating variety, commanders can reduce the risk of overuse injuries (sustained in pursuit of an APFT score) that render many of their Soldiers non-deployable. The result: a more highly trained unit with maximum deployability.”<sup>33</sup>

Physical therapists assigned to the Brigade Combat Teams are in a unique position to assist commanders develop programs that meet the physical demands of soldiering, incorporate the tasks commensurate to their profession and mitigate the risk of preventable injuries. A viable injury prevention and performance enhancement program requires a synergistic effort of the unit leadership, medical personnel and fitness experts. The remainder of this paper outlines the components of this program,

provides an example of successful implementation and finishes with future recommendations.

### Components of an Injury Prevention & Performance Enhancement Program

An effective injury prevention program must include a viable surveillance system, coordination between the medical and line leadership and implementation of training regimens that enhance the Soldier's performance and avoid unnecessary risk for injury. Instituting a culture of change requires leadership from the highest levels. Without the buy-in from management, changes will occur locally and not institutionally.

If battalion commanders desire maximum deployability, then controlling injury rates must become a priority. Often times changing the title can raise the importance of an issue. For instance, if commanders reported injuries as non-combat casualties this not only increases awareness but also emphasizes the importance of addressing this issue. The term "casualty" connotes a specific image in one's mind. It implies a serious injury and in a time of strained resources and manpower, preventable injuries are a serious issue. Commanders must have a healthy force that is capable of deploying at a moment's notice anywhere in the world. A soldier that is injured is a casualty. Fortunately, a soldier can avoid being a casualty by utilizing proper training methods. Risk management offers a process leaders implement to mitigate impediments that would adversely affect the mission. Controlling the number of non-combat casualties or injuries requires the same meticulous risk assessment.

Risk assessment is a five-step process and includes: identifying hazards, assessing those hazards to determine risks, developing controls to offset the hazards, implementing effective controls, evaluating and supervising implementation of those

controls. Establishment of an Injury Control Advisory Committee (ICAC) is one method of providing a continual risk assessment forum for the commander. One of the purposes of this committee is to ascertain unit injury rates and trends, identify possible causes, recommend interventions, enact the commander's guidance and evaluate the effectiveness of the interventions. Members should include the battalion executive officer (chairperson), company executive officers, a representative from the battalion S-3 shop, the battalion physician assistant and injury prevention subject matter experts (usually the physical therapist).<sup>34</sup> In the beginning, this committee meets weekly. Depending on its success, meetings can then go to bi-monthly.

The first step is to ascertain the extent of the problem. This requires coordination between the medical staff assigned to the battalion, the supporting medical activity and the line leadership. With the institution of the electronic medical record, a plethora of data is available within several databases that are accessible to key medical personnel. However, there are several problems with this data.

First, most medical activities or centers do not have certified coders that input the proper codes and therefore the accuracy of the correct diagnoses is somewhat skewed. Health care providers are required to code their own notes. Furthermore, a provider negotiates multiple screens before arriving at the coding section. In this section, the provider can place an additional injury code that alerts those mining the data that the purpose for that particular visit was due to an injury. The provider can also generate a profile from this section. All of these steps require extra time that most providers can ill afford.

Secondly, on most posts, the lines used to communicate electronically between the hospitals and the supported units are separate. Without global access, sharing of information becomes more cumbersome. Although the desire is real time data from the hospital, it is often impractical.

Finally, there are many inconsistencies with profiles written by the medical community. The medical personnel at the battalion level, pressured by the command, often avoid writing profiles that rest the injury long enough to allow for recovery. Many providers are not taught the proper way to complete a profile and often write inappropriate restrictions. Additionally, many medical facilities have civilian providers who are not familiar with the physical demands of various military occupational specialties and therefore write profiles that are either too restrictive or do not protect the soldier enough. To date there is not a standardized profile written for each injury. It is recommended that medical personnel utilize general standardized profile forms for typical injuries.

Utilizing standardized profile forms serves several purposes. First, it allows consistent communication between providers and the unit. Second, it simplifies the identification of particular injuries and finally, it recommends particular courses of rehabilitation that unit leadership can understand. It is worth noting that unit leaders are more receptive to Soldiers who possess “positive profiles” that dictate what the Soldier can do vice the typical profile that only states what a Soldier cannot do. An initial step in improving communication between the clinic based medical personnel and the line community is proper instruction on writing appropriate and effective profiles that enable a Soldier to continue training and contribute to the unit in a productive manner.

Proper surveillance requires the unit to devise a system or database that allows commanders immediate access to injury rates, causes and potential duty days lost. Part of the ICAC's responsibility is to collect this data, enter it into a database, assess the trends and make recommendations for improvement to the commander. Recommended data fields include the Soldier's name, unit, injury type, body part injured, mechanism of injury, profile length. Armed with this data, the injury prevention subject matter experts can assist junior commanders with program development that addresses areas of concern and ultimately decreases the incidence of injury.

After analyzing the data of injury rates and probable causes, the next step is recommending interventions. In 1983, the U.S. Army Physical Fitness School established a four-week Master Fitness Trainer (MFT) course designed to provide selected leaders with the requisite skills to become unit level fitness trainers and advisors to the command on fitness issues.<sup>35</sup> Responsibilities of the Master Fitness Trainers included assessment of individual and unit fitness, analysis of unit physical tasks and development of programs that emphasized battle focused physical training. Many units only utilized these assets by placing the MFTs in charge of physical training for injured Soldiers who had permanent and temporary profiles that precluded them from participating in regular unit physical training. Other units allowed the MFTs to design and implement programs that maximized the fitness of all the Soldiers assigned to the unit and advised the commander on injury prevention. During a time of constrained resources, the Army discontinued this program in 1992 and eliminated the additional skill identifier (ASI).<sup>36</sup>

Today, units must seek out professional assistance from personal trainers at the installation fitness facilities, medical personnel assigned to the unit or physical therapists available at the medical treatment facilities or assigned to the brigade. A physical therapist with a strength and conditioning background provides the best resource for units desiring to decrease their injury rates. Many units have Soldiers who attended the Master Fitness Training course in the past and are valuable assets that can assist the physical therapist and ensure proper implementation of the interventions. If Master Fitness Trainers are not available, then utilization of organic medical personnel is necessary for proper execution of proposed recommendations.

Currently, several ongoing pilot studies at select basic combat training and advanced individual training installations use athletic trainers as fitness experts to design programs. Unfortunately, many of these research studies were poorly structured and the data intentionally biased to support the use of athletic trainers. As part of a cost saving measure, some posts are opting to utilize athletic trainers vice physical therapists as early interventionists to detect and treat musculoskeletal conditions in an effort to prevent further injury and possibly chronic disability.

Substituting athletic trainers for physical therapists in an effort to trim budgets poses several dangers. Athletic trainers are traditionally skilled in evaluating and treating athletes who are injured either during training or during a sporting event. More often than not, a physician confirms the diagnosis and often times directs the course of treatment. Conversely, Army trained physical therapists act as physician extenders and as such, are fully capable of evaluating, diagnosing and recommending a course of rehabilitation for any musculoskeletal injury without the approval of a physician. In fact,

most primary care physicians in the Army will refer musculoskeletal injuries to the physical therapist for diagnosis and treatment. There are multiple differences between the athletic trainers and physical therapists and commanders must fully understand the limitations of both professions prior to enacting sweeping changes.

One of the best utilizations of athletic trainers occurred at Fort Campbell where trainers worked within the physical therapy clinic. Their expertise in strength and conditioning programs greatly assisted in the rehabilitation of the soldier-athlete. Moreover, as part of the physical therapy injury prevention team, the athletic trainer's skills were invaluable in designing alternative training programs that increased strength and power while preventing overuse injuries. Having athletic trainers and physical therapists together provides a unique and robust team capable of providing expert guidance to commanders on injury prevention and program design.

Experience reveals that the types of interventions range from classroom lecture to program design. A physical therapist assigned to the 3/75<sup>th</sup> Ranger Battalion collected injury data from January 2001 through April 2002. Of the 838 new injuries sustained during this period, 37% or 308 injuries were due to overuse.<sup>37</sup> Increased running mileage was the primary cause followed by ruck marching. Overall, the injuries resulted in 12,166 lost training days from Soldiers on profile.<sup>38</sup> These findings prompted the assigned physical therapist to implement a 2 week Combat Fitness Trainers Course (CFTC) designed to "train the trainer" and taught to key leaders including officers, platoon sergeants, squad leaders and team leaders. The didactic portion of the course covered injury prevention, proper running shoe selection, nutrition recommendations, use of supplements and physiology in designing appropriate physical training programs.

The physical training component included combat focused lifting using Hammer strength equipment and ground based strengthening, medicine ball drills, proper utilization of dumbbells, agility drills, plyometric training, core strengthening and aerobic/anaerobic training. Units initiated this new training in January 2003 and injury rate assessment from implementation through February 2004 showed 433 new injuries compared with 838 injuries seen in the previous study.<sup>39</sup> Both studies included data on Operation Iraqi Freedom and findings are worth discussion.

In 2002, during the first six weeks of OEF II (prior to implementation of CFTC) there were 31 overuse injuries resulting in a 16% degradation of the company's combat strength.<sup>40</sup> Many of these injuries were from running (sometimes twice a day) and improper lifting. In 2003, during the first six weeks of OEF III (after implementation of CFTC) there were only three overuse injuries however, 100% of the combat strength was maintained at the Company level.<sup>41</sup> The individuals injured had not attended CFTC within the past year and all were staff members.<sup>42</sup>

As previously mentioned, unpublished data show that between August 2005 and July 2007, 29.6% of the injuries treated in Iraq and Afghanistan were in fact chronic injuries sustained while at home station that became exacerbated when subjected to the austere conditions of deployment.<sup>43</sup> With Soldiers routinely deploying 30 out of 42 months the cumulative effect could have deleterious results and adversely affect an already strained military health care system. For the current wars in Iraq and Afghanistan, conservative estimates show the long-term costs of providing veterans medical care and disability range anywhere from \$350 to \$660 billion dollars.<sup>44</sup> For example, a "U.S. veteran who is 100% disabled and unemployable receives \$2,471 per

month from the VA. Over a 50 year period, this totals to more than 1.4 million dollars for one individual without adjustments for inflation.”<sup>45</sup> This figure does not reflect the costs associated with ambulatory hospital visits for preventable musculoskeletal injuries. Of the nearly 13 million ambulatory visits of active component service members in 2006, over 2.6 million were for musculoskeletal injuries.<sup>46</sup> Factoring in the number of lost duty days, decreased performance and rehabilitation costs, the dollars associated with these visits could reach well into the billions. These looming figures should give leaders at all levels pause for concern. Immediate measures need to be employed to mitigate the costs due to preventable injuries. It is for this reason that a team of experts at Fort Campbell enlisted the assistance of the University of Pittsburgh and Blanchfield Army Community Hospital to research the cause of injuries, determine areas of improvement and design performance enhancement programs to improve Soldier health and fitness and therefore increase combat readiness.

In 2006, the University of Pittsburgh in collaboration with the 101<sup>st</sup> Airborne Division (Air Assault) began a study to determine if there are common biomechanical, physiological or musculoskeletal characteristics that lead to increased injury rates. Researchers are analyzing the tasks and demands of Army tactical operations during training and combat. This analysis consists of an assessment of VO2 max, lactate threshold, anaerobic power, body composition, strength assessment, flexibility testing, and functional balance tests. In addition, a subset of Soldiers will also undergo simulated training tasks including overhead weighted pull-up, high vertical drop landing, and a one-legged stop-jump task over an obstacle – all tasks that are likely to present

themselves in some variation during combat. Preliminary results show deficits in several areas to include nutrition, anaerobic capacity, and balance and core strength.

Interestingly, the most common musculoskeletal complaint of Soldiers from the 101<sup>st</sup> Airborne Division, returning from Iraq was back pain. Research shows that lack of core strength contributes to increased back pain. Furthermore, multiple studies have addressed the importance of core strength to proper sequencing and utilization of the extremities. Core musculature includes those muscles closest to the spine that provide a corset affect and protect the discs and other structures. The stronger these muscles are, the less demand on the discs in the back. This is particularly important in a deployed environment where Soldiers routinely carry 40-60 pounds of gear for up to 12-16 hours at a time.

Deficits in anaerobic capacity can adversely affect a Soldier's ability to perform particularly in urban warfare where the anaerobic system provides the necessary energy for quick powerful movements and in a fight or flight situations. Energy necessary for kicking in a door or where maximal effort is given for 1-3 minutes such as an 800-meter run, combatives or running up a flight of stairs depends solely upon the anaerobic system. Current training regimens spend an inordinate amount of time training the aerobic system with endurance runs vice the anaerobic system via hills and intervals.

Poor balance and kinesthetic awareness has direct implications in deployed environments as Soldiers are often jumping off the backs of trucks or off obstacles and must possess the ability to right themselves without injuring the lower extremities. The University of Pittsburgh researchers hope to continue to use this study to assess

soldiers from various units with varying MOS's to determine the appropriate training programs that maximize performance but decrease the potential for injury.

Based upon these initial findings, the Fort Campbell physical therapy clinic designed an interim physical training program that addressed the above deficits. With the support of the Commanding General and the Medical Activity (MEDDAC) Commander, the physical therapy clinic created a team of instructors that trained units on injury prevention. Upon request, teams ran a 90-minute physical training session at the unit that employed a dynamic warm-up versus static stretching; movement drills rather than the traditional calisthenics; plyometric training; speed and agility drills; core strengthening and finished with a running shoe selection class.

To push the injury prevention initiative, the Commanding General invited the Chief of Physical Therapy to present a briefing during the monthly Commander's Conference. The brief covered current injury trends and provided suggestions for changes to training programs in an effort to reverse these trends. All Battalion Commanders and Command Sergeants Majors attended the briefing and as a result, requests for unit training began in earnest in January 2007 and by June over 5,000 Soldiers had received this new approach to physical training.

Units received training materials, recommended equipment lists as well as personalized instruction. Within weeks, many units began to incorporate these training techniques into their traditional physical training programs. In June, the physical therapy clinic completed and distributed an injury prevention and performance enhancement guide for commanders and leaders titled "Building the Tactical Athlete." The manual covers the necessary components for designing and executing a realistic unit physical

training program that enhances performance and avoids the unnecessary risk of overuse injuries. It is one of several references currently available for commanders to consider before implementing any physical training program.

### A Success Story

A successful unit physical training program analyzes the physical demands of the tasks required of Soldiers in the unit, the current fitness levels of Soldiers newly assigned to the unit and the rehabilitation of injured Soldiers within the unit prior to beginning any training regimen. One unit assigned to the 101<sup>st</sup> Airborne Division (Air Assault) from 1998-2000 implemented a comprehensive unit physical training program that addressed all of the above issues. Armed with senior leaders who had backgrounds and interests in exercise physiology and injury prevention, the unit went from the worst in the XVIII Airborne Corps to the best as shown below. How did this unit accomplish so much in a relatively short period?

First, the senior leadership recognized that not every Soldier in the unit had the same physical capabilities. This prompted the leadership to design a multi-facet physical training program. Some guidelines remained the same regardless of the group exercising. For instance, Soldiers required two days of non-impact activity after every road march. For this reason, road marches occurred on Fridays to allow the weekend for recovery. Additionally, there was emphasis on increased intensity in running as well anaerobic training versus simply piling on long, slow miles. Another key to success was the decentralization of training down to platoon and squad leaders. This allowed increased flexibility and encouraged ability group training whereby Soldiers trained with other Soldiers of similar physical capabilities.

Another program entitled, “Centurion Physical Training” ensured newly assigned Soldiers became fit aerobically, anaerobically and had the requisite muscular strength and endurance to meet all unit goals and standards without risk of program induced injury or profile.<sup>47</sup> Physical Fitness tests given to the Centurion Soldiers before and after participation in the 10-week program showed improvement in every event (sit-ups, push-ups, 2-mile run) as well as chin-ups. More importantly, these Soldiers learned to train correctly and incurred no injuries. The final component to this success story was the battalion’s Special Populations physical training program. With support from the Battalion Commander, the Battalion Executive officer championed this program. It required collaborative efforts between the battalion medical personnel and the company executive officers. Medical personnel tracked injury rates, reviewed profiles and determined which profile group the Soldier went into. Company executive officers ran one of the five profile groups listed below.

a. Bucks: consisted of Soldiers with upper extremity injuries or those Soldiers whose profile prohibited any running or swimming. The only cardiovascular workout they received was stationary bicycling. They began their workouts at the Battalion gym so they could isolate different parts of their upper body.

b. Pacers: consisted of Soldiers who had self-paced running profiles. They met at the track or at another place on post to do interval or hill workouts. This group could run but on a limited basis.

c. Lakers: consisted of Soldiers who could only swim. Their workouts were conducted at the post pool with the appropriate assistive devices.

d. Pistons: consisted of Soldiers who can swim and bike but could not run. They alternated between the pool and the gym.

e. Warriors: consisted of Soldiers who just came off profile.<sup>48</sup>

Regulation requires a Soldier be given 2 days for every day on profile not to exceed 90 days to get into physical shape once the profile expires.<sup>49</sup> This prevents reinjury. The Warriors ran every other day; the runs consisted of interval workouts, hill workouts and anaerobic threshold runs.

The team of medical personnel and executive officers met weekly to discuss changes and placement of profiles. Within eight weeks of implementing this program, the number of profiles went from 80 to 10 as shown in the chart below.<sup>50</sup>

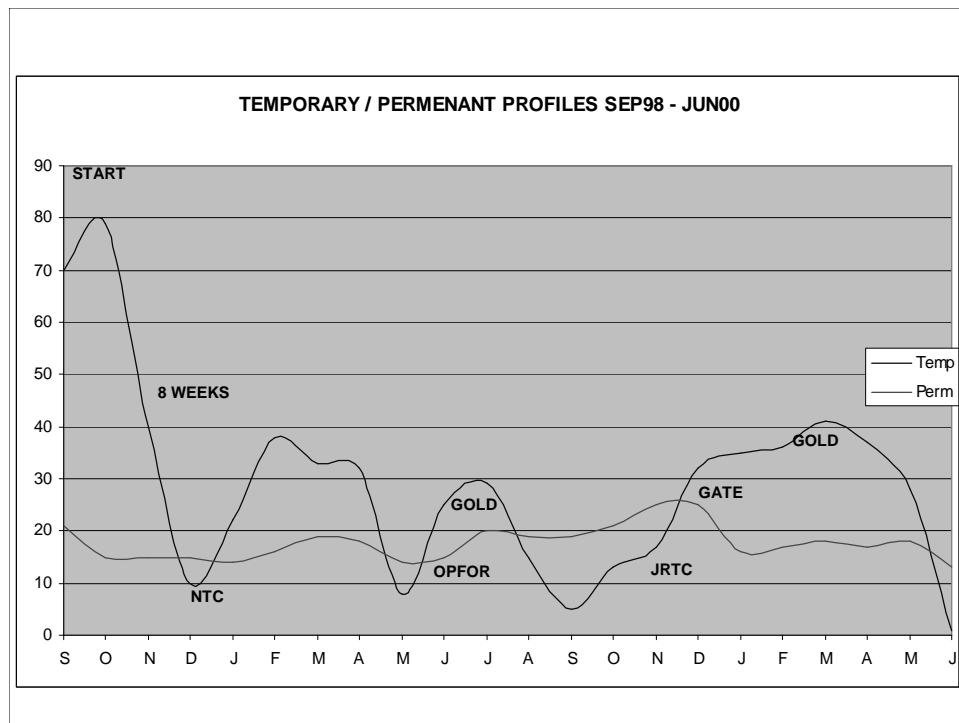


Figure 1: Temporary vs. Permanent Profiles

The rigor with which this battalion approached injury prevention had a profound effect on areas other than physical training. In many instances, the battalion went from the worst unit to the best as evidenced by the following:

- Highest enlisted retention (initial to mid-term) 8/8 quarters in the 101<sup>st</sup> Airborne Division
- Highest enlisted retention (initial to mid-term) 6/8 quarters in XVIII Airborne Corps
- 118/118 (LT-MAJ) remained in the Army
- Lowest temporary profiles 6/8 quarters in XVIII Airborne Corps
- Zero permanent profiles July 1998 – July 2000
- Highest number of Soldiers available for NTC and JRTC rotations<sup>51</sup>

### Recommendations

As previously stated, "...injuries are the single most significant medical impediment to readiness in the military."<sup>52</sup> Not only do injuries affect the strength and ability of our Armed Forces to perform their mission, they levy staggering annual costs in the hundred of millions of dollars of the operating budgets of all the services.<sup>53</sup> The costs alone should prompt leaders to implement comprehensive injury prevention programs. Units must recognize that today's recruits are less physically fit but have the capacity and willingness to excel if properly trained using a phased approach. Additionally, unit leadership must recognize the futility of continuing with traditional training programs aimed at the APFT and often result in increased injury rates. At a minimum, a comprehensive injury prevention program should:

1. Establish an injury prevention team or ICAC to advise the commander on injury rates, trends, causes and interventions
2. Obtain surveillance data that includes mechanism of injury, body part injured and days on profile
3. Implement various training programs that optimize conditions for training without increasing risk of injury. Suggested programs include ones geared for newly assigned personnel, profile PT and a prescriptive regular unit-training program
4. Utilize injury prevention experts to assist with these programs and provide the didactic training
5. Standardize profiles that reflect what the Soldier can do will assist battalion medical personnel with placing the Soldier in the appropriate profile group to maximize recovery

If the objective of the Army Physical Fitness Training Program is to enhance combat readiness by developing and sustaining a high level of physical fitness in Soldiers, then the Army can and must emphasize injury prevention in order to optimize the deployability of its Soldiers.<sup>54</sup>

## Conclusion

Traditional physical training programs ignore the current condition of Soldiers entering the Army and continue to train toward “maxing” the APFT. Soldiers who excel at sit-ups, push-ups and running prefer this type of training. On the other hand, there are a significant number of Soldiers who possess skills requiring strength, power, speed and agility. These types of Soldiers are extremely valuable in today’s environment and their skill set is more applicable to the missions in Iraq and Afghanistan. In short,

“Leading physical training does not mean leading a formation it means holding each soldier accountable for achievement of a specified training effect (aerobic, anaerobic, muscular strength and endurance) by conducting PT at the proper intensity, frequency, duration with the appropriate rest on the appropriate equipment.”<sup>55</sup> It requires the guidance of senior leaders and medical personnel and the perseverance of junior leaders to ensure its success.

## Endnotes

<sup>1</sup> Art Fritzson et al., “Military of Millennials,” Winter 2007; available from <http://www.strategy-business.com/press/article/07401?gko=01556-1876-26510823&tid=230&pg=all>; Internet; accessed 21 December 2007.

<sup>2</sup> Ibid., 3.

<sup>3</sup> Cara Spiro, “Generation Y in the Workplace,” November-December 2007; available from [http://www.dau.mil/pubs/dam/11\\_12\\_2006/11\\_12\\_2006\\_spi\\_nd06.pdf](http://www.dau.mil/pubs/dam/11_12_2006/11_12_2006_spi_nd06.pdf); Internet; accessed 22 December 2007.

<sup>4</sup> Fritzson, 3.

<sup>5</sup> James Kitfield, “Successes: Generation Y Is Producing Good Soldiers,” 19 January 2007; available from <http://nationaljournal.com/about/njweekly/stories/2007/sotu/sotu07.htm>; Internet; accessed 22 December 2007.

<sup>6</sup> Cara Spiro, “The Real Deal about Gen Y: They’re Inherently Conservative,” 17 October 2007; available from <http://blog.penelopetrunk.com/2007/10/17/the-real-deal-about-gen-y-theyre-inherently-conservative/>; Internet; accessed 22 December 2007.

<sup>7</sup> Kitfield, 1.

<sup>8</sup> Paul Sackett and Anne Mavor, eds., *Assessing Fitness for Military Enlistment: Physical, Medical and Mental Health Standards* (Traverse City, MI: Cooper Publishing Group, 2006), 6.

<sup>9</sup> Ibid., 3.

<sup>10</sup> Ibid., 2.

<sup>11</sup> Joseph J. Knapik et al., “Risk Factors for Training-Related Injuries among Men and Women in Basic Combat Training,” *Medicine & Science in Sports & Exercise* (August 2000): 952.

<sup>12</sup> Centers for Disease Control and Prevention, *Physical Activity and Good Nutrition: Essential Elements to Prevent Chronic Diseases and Obesity 2007* (Washington, D.C.: U.S. Department of Health and Human Services, April 2007), 2.

<sup>13</sup> Knapik, 950.

<sup>14</sup> Centers for Disease Control and Prevention, *Obesity among Adults in the United States – No Change Since 2003-2004* (Washington, D.C.: U.S. Department of Health and Human Services, November 2007): 4.

<sup>15</sup> Joseph J. Knapik et al., “Increasing the Physical Fitness of Low Fit Recruits Prior to Basic Combat Training: An Evaluation of Fitness, Injuries and Training Outcomes,” *Military Medicine* 171 (January 2006): 45.

<sup>16</sup> Keith G. Hauret et al., “The Physical Training and Rehabilitation Program: Duration of Rehabilitation and Final Outcome of Injuries in Basic Combat Training,” *Military Medicine* 166 (September 2001): 820.

<sup>17</sup> Ibid.

<sup>18</sup> Ibid., 825.

<sup>19</sup> Danice K. Eaton et al., “Youth Risk Behavior Surveillance—United States, 2005,” *Morbidity and Mortality Weekly Report* 55 (9 June 2006): 1.

<sup>20</sup> Ibid.

<sup>21</sup> U.S. Army Physical Fitness School, “IET Standardized Physical Training Guide,” Basic Combat Training Directorate (4 January 2005): 9.

<sup>22</sup> Joseph J. Knapik et al., “Injury and Fitness Outcomes During Implementation of Physical Readiness Training,” *International Journal of Sports Medicine* 24 (July 2003): 379.

<sup>23</sup> Ibid., 376.

<sup>24</sup> Ibid., 380.

<sup>25</sup> Sackett, 7.

<sup>26</sup> Steven Bullock, e-mail to author, 3 January 2008.

<sup>27</sup> Ibid.

<sup>28</sup> Joseph Malloy, e-mail message to author, 12 December 2007.

<sup>29</sup> Ibid.

<sup>30</sup> Josef Moore, e-mail message to author, 31 December 2007.

<sup>31</sup> Steven Bullock, "Running and Readiness," April 2003; available from <http://www.armymedicine.army.mil/hc/healthtips/13/runningreadiness.cfm> ; Internet; accessed 17 March 2008.

<sup>32</sup> Christine Iverson et al., *Building the Tactical Athlete: An Injury Prevention and Performance Enhancement Guide for Commanders and Leaders* (Fort Campbell: Blanchfield Army Community Hospital, June 2007), 4.

<sup>33</sup> Ibid.

<sup>34</sup> In an effort to reduce redundancy and meeting requirements, the members of this committee are the same as those responsible for the battalion profile physical training program discussed later in this paper.

<sup>35</sup> *Directorate of Basic Combat Training*, available from <http://www.bct.army.mil/pfs.aspx>; Internet; accessed 22 December 2007.

<sup>36</sup> Ibid.

<sup>37</sup> David Meyer, e-mail message to author, 10 September 2004 .

<sup>38</sup> Ibid.

<sup>39</sup> Ibid.

<sup>40</sup> Ibid.

<sup>41</sup> Ibid.

<sup>42</sup> Ibid.

<sup>43</sup> Josef Moore, e-mail to author, 31 December 2007.

<sup>44</sup> Evan Kanter, "Shock and Awe Hits Home," November 2007, 6; available from <http://www.psr.org/site/DocServer/ShockandAwe.pdf?docID=3161>; Internet; accessed 18 March 2008.

<sup>45</sup> Ibid.

<sup>46</sup> U.S. Department of the Army, "Army Injury Surveillance – Ambulatory Visits among Members of Active Components, U.S. Armed Forces 2006," April 2007; available from [http://amsa.army.mil/1msmr/MSMR\\_TOC.htm](http://amsa.army.mil/1msmr/MSMR_TOC.htm); Internet; accessed 31 December 2007.

<sup>47</sup> Terry Sellars, e-mail to author, 14 February 2007.

<sup>48</sup> Terry Sellars, e-mail to author, 14 February 2007.

<sup>49</sup> U.S. Department of the Army, *Physical Fitness Training*, Field Manual 21-20 (Washington, D.C.: U.S. Department of the Army, 30 September 1992), 14-20.

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<sup>52</sup> Sackett, 79.

<sup>53</sup> Department of Defense Injury Surveillance and Prevention Work Group, "Atlas of Injuries in the U.S. Armed Forces," *Military Medicine* 165 (Suppl) (August 1999): 1-22.

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